

Roll No.....

Total No. of Printed Pages: 1

Total No. of Questions: [11]

M. Sc. (Physics) (Semester -2nd)
ELECTRODYNAMICS-I
SUBJECT CODE: MPHYS1-208
Paper ID: [18220706]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 8 marks each. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(4 marks each)

- Q1.** Find the electric flux density in free space if the electric field, $E = 6\hat{i} - 2\hat{j} + 3\hat{k}$, V/m.
- Q2.** A magnetised piece of matter has magnetic moment 0.9 SI units. If the piece of matter is 12 cm long and 0.5 cm² area of cross section. Calculate intensity of magnetisation and magnetic flux density of the piece of matter.
- Q3.** Distinguish between unpolarised and polarised light. State any one method of producing polarised light.
- Q4.** If the electric field in free space is given by $E = 10 \sin(\omega t - \beta z) \hat{j}$ V/m, determine D and B.

Section – B

(8 marks each)

- Q5.** State and derive Poission's equation in electrostatics. Show that the function $\phi = x^2 - y^2 + z$ satisfies Laplace's equation.
(4,4)
- Q6.** What is the significance of boundary conditions? Derive boundary conditions for B & H. (2,6)
- Q7.** State and prove equation of continuity. Also write its physical significance. Why Hertz potential is called as super potential.
(4, 2, 2)
- Q8.** Two nicol prisms are set so that maximum light is transmitted. Through what angle should one of the prisms be rotated to reduce the intensity to one half? State and explain the phenomenon of total internal reflection.
(3,5)

Section – C

(10 marks each)

- Q9.** State the significance of gauges. Mathematically prove that Coulomb gauge is a transverse gauge.
- Q10.** Differentiate between scaler and vector potentials. Starting from Biot and Savart's law prove that no free isolated magnetic poles exist
- Q11.** Distinguish between orientation and induced polarisation. Out of these polarisation which one is temperature independent and why? Derive relation between molecular polarization and electric susceptibility.